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Greening the Business Environment

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Abstract

The emerging environmental issues have driven manufacturers to start applying green supply chain management (GSCM) concept and practices. GSCM has been considered as a management tool to enhance the environmental sustainability and performance of manufacturing firms. However, there are still limited studies to investigate GSCM practices and its implementation especially in developing countries such as Malaysia. Since green issues are new and still developing in Malaysia, constant study is needed to fully understand and update information regarding this area. Therefore, this conceptual paper provides an insight on the definition and implementation of GSCM as well as to illustrate the current state of GSCM adoption in Malaysia. This paper is expected to present a thorough review on the three main practices of GSCM namely eco-design, green purchasing and reverse logistics. Eco-design mainly aims to decrease the product's environmental effect; while green purchasing is inevitably important to minimize the environmental effect of purchased materials; and reverse logistic concentrates on the logistic and inventory activities. It is hoped that this conceptual paper would be beneficial in helping manufacturing firms in Malaysia to identify effective approach towards successful green supply chain practices.

Keywords: Green supply chain, GSCM, green practices, eco design, green purchasing, reverse logistic.

Introduction

Owing to the competitive and regulated environment characterized by community

pressures that organizations thrive in, it is crucial for organizations to create a balance between their economic and environmental performance [1]. Moreover, with increasing stress for environmental sustainability, manufacturers will require the implementation of strategies to minimize the products and services impact on the environment. It is without a doubt that environmental sustainability is among the issues that stand out in the present and is expected to stand out in the future decades. In other words, environmental sustainability has become a necessity as opposed to being an option.

In addition, industrialized nations are in the midst of an environmental issue owing to the increased pollution in the environment, waste and the increasing utilization of natural resource. Added to this, individual corporations or whole industries are the reasons behind the environmental issues. Human society highly depends on industrial development for their sustenance and this in turn, would lead to adverse impacts on the environment and future societies. Moreover, the increasing industrialization has corporations consume resources and disseminate emissions to the environment in their manufacturing of products. The truth of the matter is, environmental waste stemming from the two stages (use and disposal) is higher in level in comparison to the wastes in the stage of manufacturing. For example, the environmental loads from the manufacturing stages of goods such as paper towels and aluminium foil are higher but the total load is definitely higher compared to it.

More importantly, the primary cause of the present day environmental issue has been attributed to the environmental loads happening throughout the life cycle of the product. Although efforts have been exerted to minimize environmental issues, they show no sign of slowing down but instead, it has a tendency to increase. Several effective methods have been proposed in the past few years to manage the environment. These methods directed environmental management (EM) from waste treatment and end-of-pipe control indicating responsibility for environmental footprints which were considered in the past as mere incidental occurrences. Therefore, a need exists to shift from an environmental management paradigm concentrating on clean up and control to a paradigm that avoids environmental damage via the product's entire life cycle. Following in this direction calls for an extensive method to minimize pollution by focusing on the source at each product life cycle stage (from raw material extraction to final disposal) [2].

The increasing focus on environmental protection on a global scale has added values to the green supply chain management (GSCM), encouraged by the heightening stress from the operations and supply chain management (SCM) researchers and practitioners. Added to this, the development of GSCM is primarily driven by environmental deterioration. Hence, GSCM has been considered as a management tool for prominent manufacturing organizations particularly for the enhancement of environmental sustainability and performance through three basic green practices which will be discussed in the next few sections of this conceptual paper.

Definition of Green Supply Chain Management

SCM is a concept that has been utilized to shed a light on the plans and controls

of materials and information flow along with the logistic activities internal and external to the company. Supply chain refers to the cohesive process of manufacturing whereby raw materials are transformed into final products and distributed to customers and retail. Because of the current modifications in environmental needs that affect manufacturing operations, focus has increased towards the development of strategies of environmental management for the supply chain. This brought about concepts of GSCM and has made them a priority in business. Changes in the environment that have resulted in public urging and passing of legislations drove the shift in the manufacturing firms practices.

Greening the supply chain can be seen as means to respond to the environmental awareness issues from the perspective of the practitioners. Green policies and guidelines have been adopted by many governments from developed countries to enhance the realization of sustainable production and consumption within their own society and at the global level. The majority of firms in these developed countries have also taken the same approach at the institutional level thus making the green supply chain a concrete reality with significant impact on trade. In addition, GSCM stems from studies dedicated to the field of supply chain management and environmental management.

The green component's inclusion to the SCM entails the consideration of the influence and associations between supply-chain management and the natural environment. Akin to the supply-chain management concept, the GSCM boundary largely depends on the investigator's goal. GSCM has been defined in literature in an extensive range – from green purchasing to integrated supply chains flowing from supplier to manufacturer, and from manufacturer to customer. This is why GSCM is referred to as the inclusion of environmental thinking in SCM that covers design of product, material sourcing and selection, manufacturing processes, customer delivery and lastly, product end-of-life management.

Effect of Supply Chain Management and Green Supply Chain Management

SCM has been one of the forefront topics considered by industrialists in terms of strategic planning in the supply chain process design, maintenance and operation to satisfy needs of end users. Despite the achieved enhancements via successful practices of SCM, some firms still overlook environment issues including global energy, global warming, reverse logistics, concerns of environmental ecology in the global scenario and this has been the motivation behind countless of researches in different fields.

The current issues indicate a commonly held appeal particularly in terms of the ISO 14001 application or the environmental management system (EMS) standards application. Meanwhile, the environmental awareness of the public has showed an increase via formal/informal environmental information channels. Thus, a systematic method through GSCM has been acknowledged by major organizations.

Several research streams have focused on the examination of environmental topics such as the greening of business and supply chain in terms of its dynamics and variables, reverse logistics, green purchasing, life cycle analysis and environmental design. Through GSCM, information sharing is made possible among suppliers,

manufacturers, retrieving trader, law enforcement agency and user via a useful tool like the internet and this primarily covers the data of green material selection, product design, evaluation and selection of supplier, green product, delivery and distribution, recovery of packed solid and wastes. Moreover, GSCM has taken the position of a useful management tool that enhances EMS and the performance of manufacturing and operations [3,4].

Evidently, GSCM is increasingly garnering interest among practitioners and researchers of operations and SCM. Its heightening significance is primarily urged by the continuous environmental damage such as the decreasing raw material resources, ever-increasing waste sites and pollution level. The issue is not just about being environmentally friendly but it is also about adopting a good business outlook and higher financial gains. It is without a doubt that GSCM drives business value as opposed to controlling cost. Because GSCM is driven by the regulatory requirements as well as consumer pressures, its scope has been extended to encapsulate reactive monitoring of the general environment management programs and implemented proactive practices carried out through several reverse activities involving the reduction, re-use, reworking, refurbishment, reclaiming, recycling, remanufacturing and adoption of reverse logistics.

Although GSCM is being adopted by the industry, this adoption does not have the same extent in different parts of the world as the level of its implementation mode significantly differs [5]. Consequently, many researchers have been captivated into determining the strategy and methodology to improve practices of GSCM [6,7]. Prior studies lacked the focus on GSCM and this resulted in the insufficiency on the information concerning its aspects and facets. Specifically, reference [8] presented a demonstration of a critical appraisal of the progress being made in industrial ecology while reference [9] concentrated on green design and reference [10] examined the relationships between SCM green practices and supply chain performance.

Additionally, several studies have developed conceptual models through data analysis and reported as to which of the green practices positively impacts quality, customer satisfaction and efficiency but adversely impacts supply chain performance. Furthermore, some researchers conducted research focusing on the moderating role of relationship conditions on the customer-supplier relationship and the effectiveness of the environmental performance needs of the customer [11]. In the context of Sweden, reference [12] examined ISO 14001 and its role in environmental SCM in terms of how to relay the requirements to the supplier in order to motivate and allow the supplier and to confirm that he adheres to the given requirements.

Despite the fact that prior studies shed a light on the understanding of the GSCM effects upon performance, most of them failed to investigate the association between green practices and performance, specifically sustainable performance. Hence, there is a need to examine GSCM with a particular focus on its practices since little attention has been dedicated to it in terms of GSCM implementation. Furthermore, majority of the studies reported mixed results concerning the GSCM practices-performance relationship. While some revealed a positive relationship, others reported a negative one, indicating a significant effect of other factors that may modify the possible GSCM practices- performance relationship.

State of Gscm Adoption in Malaysia

In Malaysia, the study of GSCM was initiated in the 2000's indicating that the concept is relatively new in the country and only a few companies have implemented it [13]. In contrast, reference [2] claimed that with regards to the green supply chain in countries comprising the South East Asian region with the inclusion of Philippines, Indonesia, Malaysia, Thailand and Singapore, practices of environmental supply chain had begun many years before that. These findings would help in manufacturing industries of the region to create a suitable GSCM practices framework and assist in minimizing environmental issues.

In the Malaysia context, among the efforts expended on green supply chain management came from reference [14], where they conducted an empirical research to explain a framework identifying the most commonly adopted green supply chain practices and their impact on environmental sustainability. Nevertheless, it should be noted that there is a dire need to examine the green practices effect on environmental sustainability while keeping the mutual understanding of every supply chain member into consideration. Prior studies have examined the impact of green practices into several performance measures but they neglected to examine the relationship of these practices with performance and the effect of supply chain integration in this relationship.

Because Malaysia's adoption of the concept is relatively new, recent studies evidenced the lack of studies addressing GSCM adoption and implementation. Several of such studies concentrated on analysing the relationship between green supply chain initiatives and the outcomes of performance [14]. In addition to this, research revealed the key initiatives (eco-design) that positively impacts the four kinds of outcomes namely environmental, economic, cost reductions and intangible outcomes). Nevertheless, information concerning green supply chain practices to be employed to support sustainable performance is still lacking – this also holds true for the information regarding the contingent relationship on supply chain integration.

Furthermore, in the context of Malaysia, studies concerning the topic are still lacking and what little studies dedicated to it reported inconclusive findings. Majority of researchers who dedicated their work to the practices of GSCM in Asian countries like China may have similar characteristic market and socio-cultural elements to Malaysia but reference [15] emphasized that different sectors of countries perceive different pressures. Similarly, according to reference [5], the extent and mode of GSCM practices implementation significantly differs in different countries, indicating that Malaysia's manufacturing industry differs from other countries owing to its background and culture. This highlights the need to examine the GSCM practices and its sustainability potential in the manufacturing industry in Malaysia. The issue is complicated by the fact that the extent of green technology adoption among Malaysian manufacturing companies is still unclear.

Moreover, several companies are still yet to adopt green supply chain management concept in their business operations. In this regard, in the context of Malaysia, reference [16] contended that fully owned companies display lower degrees

of adoption and contributions to the green supply chain practices in comparison to foreign based companies and MNCs. The limitations and barriers to the GSCM adoption in the country hinges on the size of the company and the exorbitant cost of adopting the practices. Owing to these hindrances, the Ministry of Energy, Green Technology and Water was established on the 9th of April, 2009 by the Prime Minister, Y.A.B. Datuk Sri NajibTunRazak in an attempt to urge businesses to adopt a green culture in their daily operations. Additionally, studies dedicated to investigating GSCM practices and its employment in Malaysian businesses are still few and far between. It can therefore be stated that firms in developing nations like Malaysia are still in the learning stage on the way to integrate green supply chain management practices in their business operations

Practicing Green Supply Chain Management

Environmental related issues cover both internal and external activities, whether or not they are linked to eradicating pollution prior to its dissemination, recycling waste and spent products, extracting resources and raw materials, or gathering harmful pollutants and disposing them. The lack of consensus in prior work partially contributes to the attempts of researchers to identify a unified framework for GSCM practices. The lack of such framework explains the terms various definitions, concepts and terms in literature.

Some researchers refer to green supply as the purchasing intent of the organization to improve its environment performance of purchase input. As such, green supply encapsulates different purchasing activities like organizations cooperation to decrease the logistic impact of material flows or the gathering of information regarding the characteristics of the purchased products. Some other definitions stress on the purchasing function and this shows that activities of green supply includes the purchasing function in realizing internally-focused environmental activities such as recycling, reusing and reducing source.

The number of generally acknowledged green practices characteristics in supply chain can be identified. At the basic level, environmental management in terms of the supply chain should be considered as the management of the environmentally related activities or two or more cooperating organizations. Many methods can be employed for the management, co-opt, or direct the activities in other organizations included in the supply chain. An organization can basically opt for direct involvement and investment of resource or for the enhancement of the supply chain members' environmental practices. As an alternative, it may also make use of arms-length, market mechanisms to direct practices in other organizations.

Therefore, GSCM is an invaluable strategy for major companies with practices ranging from green purchasing to integrated supply chains flowing from suppliers to customers within a close loop. There have been proposals to create models to evaluate green supply chain management practices and technology. It is crucial to know that GSCM practices dimensions can be internal or external. The former activity can be attributed to top management support, organizational environmental policy, investment recovery and green eco-design whereas the latter activity is more geared towards green purchasing, reverse logistics, and customer relationship in order to

satisfy green requirements, R&D collaboration with stakeholders and evaluation and selection of suppliers.

More importantly, the green supply chain concept is an issue that is multi-disciplined emerging from the performance of environmental management practices in supply chains. Environmental management entails the reflection of the way organizations are concerned about the natural environment and the way they lessen the adverse effects on the environment throughout their operations. Specifically, principles of environmental management lay down policies, procedures, and audit protocols for monitoring operations that produces waste materials/emissions. These principles are often in the form of standardized Environmental Management System (EMS) like the British Standard for EMS BS7750 (1994), the EU eco-management and audit scheme (1993) as well as the international standard ISO 14000 [17].

Such standards were created to provide a framework to organizations on how to implement EMS. While they may be powerful tools that could produce significant enhancements to environmental performance of organizations, they have limited focus towards the creation and documentation of environmental policies and procedures - these indicate good efforts towards enhancing environmental performance internal to the organization's boundaries but not extended across the supply chain.

Firms are able to reflect their environmental pro-activeness by adopting EMS without having to exert effort in greening their supply chains. In contrast to previous environmental management, the green supply chain adopts complete firm responsibility towards its products beginning from raw materials extraction and acquisition until the final product disposal. Basically, there are three main GSCM basic practices which must be implemented in order to achieve a better environmental sustainability and performance:

Environmental Practicing Design

Environmental-Conscious Design or Eco design, for short, refers to the activities employed throughout the product development that are undergone to minimize the product's environmental impact on the environment. This covers the acquisition of material, manufacturing, use and final disposal. Eco design is carried out while keeping other crucial product criteria into consideration (like performance and cost). Eco design is deemed to be one of the top supply chain initiatives that integrate aspects of the environment with the design of the product in a way that is appropriate to the product supply chain.

This consideration is important as most of the environmental impact stemming from the products production consumption and disposal influence the design stage decision-making. This stage signifies the definition of product, process or service function and the selection of raw materials, supplies and process chemicals to gauge the consumed energy in product creation and the waste creation. In addition to this, this stage also determines the durability, serviceability, and energy consumption of the product throughout its life cycle. Eco-design actions or activities differ from one company to another, and from one product to another but the basic eco-design activities involve the following;

a. Design to reduce/eliminate materials that are damaging to the environment – e.g. lead, mercury, chromium, and cadmium.
b. Design to reuse product or part of the product involving negligible treatment of the used product.
c. Design to recycle product that enables product disassembly, separation of parts based on material and the material reprocessing.
d. Design to remanufacture products that enable the repair, rework and re-facilitation of activities that aim to renew the product.
e. Design to enable the efficiency of resource such as minimized materials and energy consumption of product during its use and promotion of the utilization of renewable resources and energy.

Green purchasing practices

Green purchasing is considered as a practice of environmental purchasing aiming to guarantee that the bought items satisfy environmental objectives of the firm like minimizing or eradicating hazardous items, minimizes waste sources and encouraging recycling and reclamation of purchased materials. Green purchasing also refers to the fact that purchasing managers take the issue of sustainability into consideration in their purchasing of inputs and in the cost, quality and delivery of items.

The measurement of green purchasing is created based on seven main aspects of green purchasing as laid down by reference [16]. These seven aspects are content requirements, product content reductions, product content labeling, and disclosure, supplier questionnaires, EMSs, certification of supplier and supplier compliance auditing. They are explained as follows;

a. Product content requirements: in this aspect, buyers require the purchased products to have green features (can be recycled or reused).
b. Product content restrictions: under this aspect, buyers require purchased products to be free of environmentally damaging attributes (e.g. lead, CFCs, plastic foam in packaging).
c. Product content labelling/disclosure: this aspect entails the buyers requirement for the product content's environmental attributes. This can be carried out through the presence of green seals and indicators or the environmental impact (e.g. scientific certification system provided by commercial firms).
d. Supplier questionnaires: this aspect involves buyers sending questionnaires to suppliers concerning the provision of information of the latter's processes (e.g. environmental aspects, activities or management systems).
e. Supplier environmental management systems: under this aspect buyers request suppliers to create and update an environmental management system (EMS) although certification of the system may not be requested.
f. Supplier certification: this aspect involves the need for suppliers to own an EMS that is certified as fully adhering to a well-acknowledged international standard (e.g. British Standard 7750 (BS 7750), ISO 14001 from the International Organization for Standardization (ISO) or the European Union Eco-Management and Audit Scheme (EMAS).

g. Supplier compliance auditing: under this aspect, buyers request suppliers to be audited in order to identify their adherence level to the environmental requirements.

Reverse logistic practices

The focus of reverse logistics is basically on the return of products and materials from the viewpoint of supply chain consumption for recycling, reusing, re-manufacturing, repairing, or disposing. The primary logistic activities of transportation as well as inventory management are also covered by reverse logistics although it is basically concerned with product retrieval from the customers as opposed to providing them to customers. Used or end-of-life products are introduced back to the forward supply chain for the following reasons;

a. *Reuse*: refers to the collection process of used products from the field and their dissemination or sale. Hence, despite the reduction of the product's ultimate value from its original value, no additionally processing is called for.
b. *Recycling*: refers to the collection process of used products, their disassembling, and separation into categories (plastic, glass etc.), and their transformation into recycled products, elements or materials. In this case, the original materials identity and functionality is not retained.
c. *Remanufacturing*: refers to the collection process of used products from the field, and their assessment and replacement in a way that their identity and functionality is retained.

Concluding Remarks

This paper has discussed on the overview of green supply chain management (GSCM). It is expected for manufacturing organizations across the globe to give more attention to environmental sustainability issues in both internal and external activities, from the upstream to the downstream, and in every stage throughout the supply chain.

The three core practices of GSCM namely eco-design, green purchasing and reverse logistic practices are very important to minimize the effect of pollution, waste, spent products, extracting resources and materials. Unlike the traditional supply chain management practice, GSCM takes on the firm's complete responsibility towards its products from the initial stage (raw materials extraction) to final product disposal. The application of GSCM principle is applicable to the whole set of activities in the product and process development and engineering with the inclusion of the initial stages of design, procurement, production and assembly to packaging, logistics and the final stage namely distribution

Since GSCM concept is a collective approach from all constituents in the supply chain, the integration of all parties in the supply chain is paramount. Therefore, there is a need to further study the relationship of GSCM and supply chain integration elements. The combination of those two concepts would enhance both product development and environmental sustainability and performance.

Lastly, as Malaysian firms are still in the process of learning in terms of how to employ GSCM practices in their day-to-day activities; thus, it is imperative that firms

understand the determinants that can boost the effectiveness of GSCM and to attain sustainable performance. To our best knowledge, a research framework should be proposed and further empirically tested among ISO 14001 certified manufacturing firms in Malaysia.

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